AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A solid-state image sensing apparatus for performing photoelectric conversion of incident light, the solid-state image sensing apparatus comprising:

a photosensitive unit in which a plurality of photoelectric conversion circuits are arranged one-dimensionally or two-dimensionally, each of the photoelectric conversion circuits corresponding to one of a plurality of pixels, and each of the photoelectric conversion circuits including a photodiode for accumulating electric charge by performing the photoelectric conversion of incident light and an output circuit for outputting the accumulated electric charge as an electric signal;

an electric charge simultaneous removal unit operable to simultaneously remove the accumulated electric charge in each of the photodiodes disposed in a predetermined region to be read out in the photosensitive unit; and

an electric charge accumulation unit operable to accumulate electric charge in each of the photodiodes disposed in the region to be read out during a predetermined time after the accumulated electric charge in each of the photodiodes disposed in the region to be read out is removed,

wherein the output circuit in each of the photoelectric conversion circuits includes:

a first transistor for receiving a readout signal from the electric charge simultaneous removal unit and which allows the electric charge accumulated in the photodiode to pass therethrough in response to activation of the readout signal; ~~and~~

an electric charge retention unit operable to receive the electric charge that passes

through the first transistor and to retain the electric charge;

a second transistor which allows the electric signal to pass therethrough, the electric signal being based on a value of voltage determined by the electric charge retained by the electric charge retention unit; and

a reset circuit for receiving a reset signal from the electric charge simultaneous removal unit and for resetting an amount of electric charge accumulated in the electric charge retention unit in response to activation of the reset signal, ~~and~~

wherein the electric charge simultaneous removal unit simultaneously outputs the readout signal and the reset signal to all of the photoelectric conversion circuits disposed in the region to be read out, and

wherein the electric charge simultaneous removal unit includes:

a first switch transistor that serves as a switch;

a capacitor disposed between a gate and a source or a drain of the first switch transistor; and

a second switch transistor that serves as a switch,

wherein the second switch transistor receives an all pixel reset switch signal and an all pixel reset signal,

wherein the capacitor is charged during a time period in which the all pixel reset switch signal and the all pixel reset signal are input to a gate and a drain, respectively, of the second switch transistor, and

wherein, when the capacitor is charged, the reset signal is input to the drain of the

first switch transistor and is output simultaneously to all of the photoelectric conversion circuits from the source of the first switch transistor.

2. (Previously Presented) The solid-state image sensing apparatus according to Claim 1,

wherein the electric charge accumulation unit generates an electric accumulation start signal to start electric charge accumulation for each of the photodiodes disposed in the region to be read out.

3. (Previously Presented) The solid-state image sensing apparatus according to Claim 2, wherein the electric charge accumulation unit generates an electric accumulation end signal and ends electric charge accumulation for each of the photodiodes disposed in the region to be read out in response to activation of the electric charge accumulation end signal.

4. (Previously Presented) The solid-state image sensing apparatus according to Claim 2, further comprising an incident light control unit operable to control incidence of light into the photosensitive unit,

wherein the electric charge accumulation unit ends electric charge accumulation to each of the photodiodes disposed in the region to be read out using the incident light control unit by blocking out incidence of light into the photosensitive unit.

5. (Previously Presented) The solid-state image sensing apparatus according to Claim 1, further comprising an incident light control unit operable to control incidence of light into the photosensitive unit,

wherein the electric charge accumulation unit starts incidence of light to the photosensitive unit using the incident light control unit after the electric charge simultaneous removal unit simultaneously removes the accumulated electric charge for each of the photodiodes disposed in the region to be read out.

6. (Previously Presented) The solid-state image sensing apparatus according to Claim 5,

wherein the electric charge accumulation unit generates an electric accumulation end signal and ends electric charge accumulation for each of the photodiodes disposed in the region to be read out in response to activation of the electric charge accumulation end signal.

7. (Previously Presented) The solid-state image sensing apparatus according to Claim 5,

wherein the electric charge accumulation unit ends electric charge accumulation for each of the photodiodes disposed in the region to be read out using the incident light control unit by blocking out incidence of light into the photosensitive unit.

8. (Previously Presented) The solid-state image sensing apparatus according to Claim 5,

wherein the incident light control unit includes:

a liquid crystal shutter disposed between the photosensitive unit and an object to be photographed; and

a liquid crystal shutter control unit operable to apply a predetermined voltage to the liquid crystal shutter to control a penetration of light.

9-12. (Canceled)

13. (Previously Presented) A solid-state image sensing apparatus for performing photoelectric conversion of incident light, the solid-state image sensing apparatus comprising:

a photosensitive unit in which a plurality of photoelectric conversion circuits are arranged one-dimensionally or two-dimensionally, each of the photoelectric conversion circuits corresponding to one of a plurality of pixels, and each of the photoelectric conversion circuits including a photodiode for accumulating electric charge by performing the photoelectric conversion of incident light and an output circuit for outputting the accumulated electric charge as an electric signal;

an electric charge simultaneous removal unit operable to simultaneously remove the accumulated electric charge in each of the photodiodes disposed in a predetermined region to be read out in the photosensitive unit; and

an electric charge accumulation unit operable to accumulate electric charge in each of the photodiodes disposed in the region to be read out during a predetermined time after the

accumulated electric charge in each of the photodiodes disposed in the region to be read out is removed,

wherein the electric charge simultaneous removal unit simultaneously outputs a readout signal and a reset signal to all of the photoelectric conversion circuits disposed in the region to be read out,

wherein the output circuit in each of the photoelectric conversion circuits includes:

a first transistor for receiving a readout signal from the electric charge simultaneous removal unit and which allows the electric charge accumulated in the photodiode to pass therethrough in response to activation of the readout signal; and

an electric charge retention unit operable to receive the electric charge that passes through the first transistor and to retain the electric charge;

a second transistor which allows the electric signal to pass therethrough, the electric signal being based on a value of voltage determined by the electric charge retained by the electric charge retention unit; and

a reset circuit for receiving a reset signal from the electric charge simultaneous removal unit and for resetting an amount of electric charge accumulated in the electric charge retention unit in response to activation of the reset signal,

wherein the solid-state image sensing apparatus further comprises an electric signal readout unit operable to read out the electric signals outputted from the photoelectric conversion circuits disposed in the region to be read out,

wherein the electric signal readout unit includes:

a first unit operable to output the activated reset signal to the each of the reset circuits in the photoelectric conversion circuits disposed in the region to be read out; and

a second unit operable to output the activated readout signal to each of the reset circuits disposed in the region to be read out after outputting the reset signal, and

wherein the first unit outputs the activated reset signal after the predetermined time in the electric charge accumulation unit has passed.

14. (Previously Presented) The solid-state image sensing apparatus according to Claim 13,

wherein the electric signal readout unit simultaneously reads out the accumulated electric charge of each of the photodiodes disposed in the region to be read out.

15. (Previously Presented) The solid-state image sensing apparatus according to Claim 13, further comprising a frame memory that can simultaneously store all of the electric signals outputted from the photoelectric conversion circuits disposed in the region to be read out,

wherein the electric signal readout unit simultaneously transmits to the frame memory the electric signals outputted from the photoelectric conversion circuits disposed in the region to be read out.

16. (Previously Presented) The solid-state image sensing apparatus according to Claim 13, further comprising a frame memory that can simultaneously store all of the electric signals

outputted from the photoelectric conversion circuits disposed in the region to be read out,

wherein the electric signal readout unit writes to the frame memory in sequence the electric signals outputted from the photoelectric conversion circuits disposed in the region to be read out within a short period of time which is negligible compared with the predetermined time in the electric charge accumulation unit.

17. (Previously Presented) A solid-state image sensing apparatus for performing photoelectric conversion of incident light, the solid-state image sensing apparatus comprising:

a photosensitive unit in which a plurality of photoelectric conversion circuits are arranged one-dimensionally or two-dimensionally, each of the photoelectric conversion circuits corresponding to one of a plurality of pixels, and each of the photoelectric conversion circuits including a photodiode for accumulating electric charge by performing the photoelectric conversion of incident light and an output circuit for outputting the accumulated electric charge as an electric signal;

an electric charge simultaneous removal unit operable to simultaneously remove the accumulated electric charge in each of the photodiodes disposed in a predetermined region to be read out in the photosensitive unit; and

an electric charge accumulation unit operable to accumulate electric charge in each of the photodiodes disposed in the region to be read out during a predetermined time after the accumulated electric charge in each of the photodiodes disposed in the region to be read out is removed,

wherein the electric charge simultaneous removal unit simultaneously outputs a readout signal and a reset signal to all of the photoelectric conversion circuits disposed in the region to be read out,

wherein the output circuit in each of the photoelectric conversion circuits includes:

a first transistor for receiving a readout signal from the electric charge simultaneous removal unit and which allows the electric charge accumulated in the photodiode to pass therethrough in response to activation of the readout signal; and

an electric charge retention unit operable to receive the electric charge that passes through the first transistor and to retain the electric charge;

a second transistor which allows the electric signal to pass therethrough, the electric signal being based on a value of voltage determined by the electric charge retained by the electric charge retention unit; and

a reset circuit for receiving a reset signal from the electric charge simultaneous removal unit and for resetting an amount of electric charge accumulated in the electric charge retention unit in response to activation of the reset signal,

wherein the solid-state image sensing apparatus further comprises an electric signal readout unit operable to read out the electric signals outputted from the photoelectric conversion circuits disposed in the region to be read out,

wherein the electric signal readout unit includes:

a first unit operable to output the activated reset signal to each of the reset circuits in the photoelectric conversion circuits disposed in the region to be read out; and

a second unit operable to output the activated readout signal to each of the reset circuits disposed in the region to be read out after outputting the reset signal, and

wherein the first unit outputs the activated reset signal before the predetermined time in the electric charge accumulation unit has passed.

18. (Previously Presented) The solid-state image sensing apparatus according to Claim 17,

wherein the first unit outputs the activated reset signal at a time which overlaps a period before the predetermined time in the electric charge accumulation unit has passed and a period during which the electric charge simultaneous removal unit outputs the activated reset signal.

19. (Previously Presented) A solid-state image sensing apparatus for performing photoelectric conversion of incident light, the solid-state image sensing apparatus comprising:

a photosensitive unit in which a plurality of photoelectric conversion circuits are arranged one-dimensionally or two-dimensionally, each of the photoelectric conversion circuits corresponding to one of a plurality of pixels, and each of the photoelectric conversion circuits including a photodiode for accumulating electric charge by performing the photoelectric conversion of incident light and an output circuit for outputting the accumulated electric charge as an electric signal;

an electric charge simultaneous removal unit operable to simultaneously remove the accumulated electric charge in each of the photodiodes disposed in a predetermined region to be

read out in the photosensitive unit; and

an electric charge accumulation unit operable to accumulate electric charge in each of the photodiodes disposed in the region to be read out during a predetermined time after the accumulated electric charge in each of the photodiodes disposed in the region to be read out is removed,

wherein the electric charge simultaneous removal unit simultaneously outputs a readout signal and a reset signal to all of the photoelectric conversion circuits disposed in the region to be read out,

wherein the output circuit in each of the photoelectric conversion circuits includes:

a first transistor for receiving a readout signal from the electric charge simultaneous removal unit and which allows the electric charge accumulated in the photodiode to pass therethrough in response to activation of the readout signal; and

an electric charge retention unit operable to receive the electric charge that passes through the first transistor and to retain the electric charge;

a second transistor which allows the electric signal to pass therethrough, the electric signal being based on a value of voltage determined by the electric charge retained by the electric charge retention unit; and

a reset circuit for receiving a reset signal from the electric charge simultaneous removal unit and for resetting an amount of electric charge accumulated in the electric charge retention unit in response to activation of the reset signal,

wherein the solid-state image sensing apparatus further comprises an electric signal

readout unit operable to read out the electric signals outputted from the photoelectric conversion circuits disposed in the region to be read out,

wherein the electric signal readout unit includes:

a first unit operable to output the activated reset signal to each of the reset circuits in the photoelectric conversion circuits disposed in the region to be read out; and

a second unit operable to output the activated readout signal to each of the reset circuits after outputting the reset signal, and

wherein the first unit outputs the activated reset signal for a period starting from a mid point of the predetermined time until an end of the predetermined time in the electric charge accumulation unit.

20-21. (Canceled)

22. (Currently Amended) A camera for photographing an object, the camera comprising:

a solid-state image sensing apparatus; and

a mechanical shutter,

wherein the solid-state image sensing apparatus includes:

a photosensitive unit in which a plurality of photoelectric conversion circuits are arranged one-dimensionally or two-dimensionally, each of the photoelectric conversion circuits corresponding to one of a plurality of pixels, and each of the photoelectric conversion circuits

including a photodiode for accumulating electric charge by performing the photoelectric conversion of incident light and an output circuit for outputting the accumulated electric charge as an electric signal;

an electric charge simultaneous removal unit operable to simultaneously remove the accumulated electric charge in each of the photodiodes disposed in a predetermined region to be read out in the photosensitive unit; and

an electric charge accumulation unit operable to accumulate electric charge in each of the photodiodes disposed in the region to be read out during a predetermined time after the accumulated electric charge in each of the photodiodes disposed in the region to be read out is removed; and

an incident light control unit operable to control incidence of light into the photosensitive unit,

wherein the mechanical shutter is disposed between the photosensitive unit of the solid-state image sensing apparatus and an object to be photographed,

wherein the electric charge accumulation unit ends electric charge accumulation to the photodiodes disposed in the region to be read out using the incident light control unit by blocking out incidence of light into the photosensitive unit,

wherein the incident light control unit controls incidence of light into the photosensitive unit by controlling opening and shutting of the mechanical shutter,

wherein the output circuit in each of the photoelectric conversion circuits includes:

a first transistor for receiving a readout signal from the electric charge

simultaneous removal unit and which allows the electric charge accumulated in the photodiode to pass therethrough in response to activation of the readout signal; ~~and~~

an electric charge retention unit operable to receive the electric charge that passes through the first transistor and to retain the electric charge;

a second transistor which allows the electric signal to pass therethrough, the electric signal being based on a value of voltage determined by the electric charge retained by the electric charge retention unit; and

a reset circuit for receiving a reset signal from the electric charge simultaneous removal unit and for resetting an amount of electric charge accumulated in the electric charge retention unit in response to activation of the reset signal, ~~and~~

wherein the electric charge simultaneous removal unit simultaneously outputs the readout signal and the reset signal to all of the photoelectric conversion circuits disposed in the region to be read out, and

wherein the electric charge simultaneous removal unit includes:

a first switch transistor that serves as a switch;

a capacitor disposed between a gate and a source or a drain of the first switch transistor; and

a second switch transistor that serves as a switch,

wherein the second switch transistor receives an all pixel reset switch signal and an all pixel reset signal,

wherein the capacitor is charged during a time period in which the all pixel reset

switch signal and the all pixel reset signal are input to a gate and a drain, respectively, of the second switch transistor, and

wherein, when the capacitor is charged, the reset signal is input to the drain of the first switch transistor and is output simultaneously to all of the photoelectric conversion circuits from the source of the first switch transistor.

23. (Currently Amended) An image sensing method for photographing an object using a solid-state sensing apparatus,

wherein the solid-state image sensing apparatus includes a photosensitive unit in which a plurality of photoelectric conversion circuits are arranged one-dimensionally or two-dimensionally, each of the photoelectric conversion circuits corresponding to one of a plurality of pixels, and each of the photoelectric conversion circuits including a photodiode for accumulating electric charge by performing the photoelectric conversion of incident light and an output circuit for outputting the accumulated electric charge as an electric signal,

wherein the output circuit in each of the photoelectric conversion circuits includes:

a first transistor for receiving a readout signal from the electric charge simultaneous removal unit and which allows the electric charge accumulated in the photodiode to pass therethrough in response to activation of the readout signal; ~~and~~

an electric charge retention unit operable to receive the electric charge that passes through the first transistor and to retain the electric charge;

a second transistor which allow the electric signal to pass therethrough, the

electric signal being based on a value of voltage determined by the electric charge retained by the electric charge retention unit; and

a reset circuit for receiving a reset signal from the electric charge simultaneous removal unit and for resetting an amount of electric charge accumulated in the electric charge retention unit in response to activation of the reset signal, and

wherein the electric charge simultaneous removal unit simultaneously outputs the readout signal and the reset signal to all of the photoelectric conversion circuits disposed in the region to be read out,

wherein the electric charge simultaneous removal unit includes:

a first switch transistor that serves as a switch;

a capacitor disposed between a gate and a source or a drain of the first switch transistor; and

a second switch transistor that serves as a switch,

wherein the second switch transistor receives an all pixel reset switch signal and an all pixel reset signal,

wherein the capacitor is charged during a time period in which the all pixel reset switch signal and the all pixel reset signal are input to a gate and a drain, respectively, of the second switch transistor, and

wherein, when the capacitor is charged, the reset signal is input to the drain of the first switch transistor and is output simultaneously to all of the photoelectric conversion circuits from the source of the first switch transistor, and

wherein the image sensing method comprises:

simultaneously removing the accumulated electric charge in each of the photodiodes by simultaneously outputting the readout signal and the reset signal to all of the photoelectric conversion circuits disposed in a predetermined region to be read out in the photosensitive unit; and

accumulating electric charge in each of the photodiodes disposed in the region to be read out during a predetermined time after the accumulated electric charge of the photodiodes disposed in the region is removed.

24. (Currently Amended) The solid-state image sensing apparatus according to Claim 1,

wherein the electric charge simultaneous removal unit aligns a pulse of the reset signal and a pulse of the readout signal ~~signal, and simultaneously outputs the readout signal and the reset signal to all of the photoelectric conversion circuits disposed in the region to be read out~~.

25. (Currently Amended) The solid-state image sensing apparatus according to Claim 1,

wherein the ~~electric charge simultaneous removal unit simultaneously outputs the readout signal and the reset signal to all of the photoelectric conversion circuits disposed in the region to be read out, the~~ reset signal ~~having~~ has a width of a pulse that is wider than a width of a pulse of the readout signal.